



## **Mobile measurements of ammonia: Sources and spatial variations in the Wallis region and Zurich (Switzerland)**

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Ammonia (NH<sub>3</sub>) has negative impacts on human health, climate, ecosystems and materials. Moreover, it is also an important precursor for the formation of secondary aerosols in the form of ammonium salts (ammonium nitrate, ammonium sulfate and ammonium chloride). Previous studies have shown that the vast majority of the ammonia emissions come from the agricultural sector (mostly from livestock farming and fertilizing activities). Other sources such as road transport, waste deposit, energy use and supply can also contribute to the ammonia levels in the urban areas. High concentrations of ammonia are commonly measured at the National Air Pollution Monitoring Network (NABEL) stations in Switzerland.

Mobile measurements of ammonia and other pollutants (including BC, CO<sub>2</sub>, NO<sub>x</sub> and NR-PM) were conducted in the Wallis region and in Zurich in 2013 to study the spatial distribution of ammonia in Switzerland and identify its major emission sources in these regions. A new heated inlet setup was developed to improve the response time of the ammonia measurements, so that even very local sources could be identified.

For both, the Wallis region and Zurich, it was observed that the background values of ammonia have a regional origin, as other pollutants affected by regional changes show similar background trends. These regional background values varied between 5 to 10 ppb during the different days of measurements. Moreover, no big differences were observed in the background values between the city center, the surrounding areas, the highway and the rural areas. The major local source of ammonia observed during these measurements was road transport, producing increases on the NH<sub>3</sub> levels up to 4 times the background values. Based on emission factors estimated from tunnel measurements, the traffic was estimated to contribute between 20 -30% of the measured ammonia levels on a daily average in Zurich. Other sources of ammonia that can also contribute significantly to the levels of ammonia were also observed. These sources include wood burning (with enhanced effect in the Wallis region), cooking, agricultural activity and compost.